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Maine Agricultural Experiment Station

ORONO

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INSECT NOTES FOR 1909

This bulletin contains brief accounts of some of the more important insects of the year 1909, among them the Gypsy and Brown Tail Moths and San Jose scale, as well as more extended descriptions of the early stages of the Spindle worm moth, Birch leaf Bucculatrix, Apple leaf Sewer, a fungus gnat, two crane flies, a potato maggot and a fruit feeding beetle.

MAINE

AGRICULTURAL EXPERIMENT STATION

ORONO, MAINE.

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BULLETIN No. 177.

INSECT NOTES FOR 1909.*

OSKAR A. JOHANNSEN.

A miscellaneous lot of notes comprising both new observations, notices of species dealt with more fully in other publications, and mere statements of insect situations fall conveniently into an annual bulletin under the title of *Insect Notes*. In this publication compilations and remedial measures are both avoided for the most part, as the economic necessity for either of these is met by illustrated descriptive circulars more satisfactory to the people of the state who submit the standard troublesome insects for determination.

The briefer notes of miscellaneous character found in this bulletin are transferred with a little editing from the entomological note books of the department. The Lot numbers here given are merely references to Station records for the species in question and have no significance beyond permanently linking the published account to the Station collection and notes, which is in some cases desirable.

* Papers from the Maine Agricultural Experiment Station: Entomology No. 41.

LEPIDOPTERA.
(Butterflies and Moths.)

FOREST CATERPILLARS.

Heterocampa guttivitta (The Saddled Prominent).

As during 1907 and 1908, the Saddled Prominent caterpillar was exceedingly destructive to beech and other deciduous forest trees during the summer of 1909, and many areas were entirely stripped of their leaves. The total amount of damage, however, was conspicuously less than during 1908, as would be expected from the wholesale death of this species from fungus disease over extended areas late the previous season. This remarkable outbreak of a species usually not troublesome is fully discussed in Bulletin No. 161 of this Station. For the past season there is little general information to add except to state that the trouble was very much less serious last summer.

Other species have been very destructive in forest and shade trees during the summer of 1909 as was the case for the two previous seasons, for Maine has experienced three consecutive caterpillar summers. The Green-striped Maple-worm (*Anisota rubicunda*), the Rosy-striped Oak-worm (*Anisota virginienensis*), and the White Tipped Moth (*Symmerista albifrons*) were especially guilty. These received a fuller discussion in Bulletin No. 162. of this Station last year.

Acrobasis rubrifasciella, a species abundant for several seasons in Sweet fern (*Myrica asplenifolia* L.), constructing in a tangle of leaves curious trumpet shaped cases, was very generally numerous again during the past summer. It was, however, attacked by parasites in great numbers during 1909.

Hyphantria cunea, the Fall Web-worm,* a common orchard pest, was so unusually abundant upon orchard, shade and forest trees as to rank among the conspicuous pests of 1909, the unsightly webs being met with everywhere. Attendant parasites were common.

* A descriptive economic circular is available to applicants.

Achatodes zeae (Spindle worm).

In June the new shoots of the elder may be found to be withered and dying and if the twig be cut open a white caterpillar with black spots may be seen feeding upon the pith. This is the spindle worm, the larva of the little moth *Achatodes zeae*. The species, first described by Harris, and well known to systematists, has rarely since been mentioned by economic entomologists. Besides the elder, it also is injurious to corn, dahlia, and perhaps other thick-stemmed plants. In the elder twigs the caterpillar when full grown gnaws towards the surface at some point, usually near a twig node, pierces the bark or leaves a thin layer unbroken, then pupates within its burrow. The adults emerge in July and August. We have reared specimens at Orono, Maine, bearing the date August 6, and also have specimens from Ithaca, New York, which emerged July 14. According to Forbes the adults in Illinois appear the latter part of June.

The full grown caterpillar, which is about one inch long, is yellowish white in color with flat blackish tubercles each with a single bristle. On the first and second abdominal segments the tubercles are arranged as follows: one on each side of the mid-dorsal line, a second behind and below this, four grouped around the spiracle of which the third is above and slightly in front of it, the fourth behind, the fifth very small, in front and above, the sixth directly below it; the seventh to the tenth are on the ventral side of the segment, the eighth being very much smaller, and the seventh of the first segment bears two bristles. In some specimens and on some segments the third and fifth tubercles are nearly or quite fused. The preanal and the anal plates (fig. 26) are contiguous but not fused. The hooks of the abdominal legs are uniform in size, about 22 in number, the circle being widely open outwardly. The palpi of the second maxillae are short and thick (fig. 24).

The pupa is reddish brown in color, over half an inch in length, at the head end with two stout rounded tubercles, the posterior end with the stout spines (fig. 27). The adult, which expands over an inch, has rust red fore wings mottled with gray, with orange spots near the tip, and yellowish gray hind wings. It is figured by Holland in his Moth Book.

Bucculatrix canadensisella (The Birch leaf Bucculatrix).

During the first week in September the leaves of the white and yellow birch in various parts of the State were much injured by the caterpillar of the Birch leaf Bucculatrix. The injured leaves (fig. 19) had much of the green parenchymal tissue eaten away, leaving only the epidermis of one side as a transparent film, and even this was found pierced here and there. Every birch in sight seemed to be infested and had a brown and scorched appearance, visible even at a great distance.

The full grown caterpillar is less than $\frac{1}{4}$ of an inch in length, of slender form, with deep incisures between the rounded segments. The head is pale brown; the body, dull pale yellowish green. The first and second abdominal segments each have six pairs of rather long bristles besides a few very minute ones; the bristles of the following segments are somewhat similarly arranged. There appear to be no distinct tubercles, nor is there an anal fork. Each abdominal leg has 3 pairs of claws (fig. 36); except the anal legs have but one claw each (fig. 37). The palpi of the second maxillae are slender, each provided with long bristles. The other mouth parts are as figured (33-35).

The molting cocoons are small, circular, white, silken patches in which the larva lies curled up and may be found on the surface of the leaf (fig. 19) and also on the under side of twigs and branches. When the larva has attained its full growth the true pupal cocoon is formed. This is an oval yellowish body with flat base and with 5 or 6 sharp longitudinal ridges. These cocoons have been found on the twigs and leaves but as comparatively few are present there it is evident that the greater number of larvae pupate elsewhere. The moths which have a spread of wing of $\frac{3}{8}$ of an inch have dusky wings crossed by several silvery white bars. They appear in early spring. While the larvae attack the Birch by preference we have found them on Red Oak also.

For ornamental trees, a weak arsenical spray applied early in August has been recommended. (Lot 793.)

Gypsy and Brown-tail Moths.

On account of the seriousness of the Brown-tail Moth and Gypsy Moth situation these two insects should be constantly

held in mind by the people of the State. In response to our request, Mr. E. F. Hitchings, State Entomologist, has kindly sent us a brief statement which we give here in full concerning the work with these two insect pests which is being carried on under the supervision of the State Department of Agriculture.

"The gypsy moth situation in Maine at the close of the year 1909 is serious in the extreme. Although the field work, under the direct management of the special field agent, Capt. E. E. Philbrook, has been conducted with the same painstaking methods as in the past, yet, owing to an extended territory, opened up for the first time by the scout made in the early part of the season, and to the fact that not enough funds were available to supply a sufficiently large force, the efficiency of the work has been curtailed and we are now facing a very serious crisis. If it had not been for the assistance of the Federal Government the pest would have gained a foothold that would defy our best efforts to control. The situation is a grave one and should enlist the hearty cooperation of every good citizen of the State. The moth is a menace to our northern woods, and those interested should see to it that sufficient aid is rendered to check its onward march northward. York County is still the fighting ground, although one small infestation has been found at Gorham this fall."

Brown-tail Moth Outlook.

"In the southern counties of the State where this pest was first introduced, it is a serious menace to the summer people who come to us for rest and recreation. Many cases of "brown-tail rash" proved quite serious during the past summer, and one of the scouts who was very badly afflicted died. The ravages of the moth can be controlled on the fruit and shade trees by spraying, but this is a very expensive method, especially for the shade trees. Gathering and burning the winter nests for such trees should be annually practised. The spread northward has been all along the line. The moths were found in Madison during the summer and nests were taken at Sangerville during the spring. A scout was made in Bangor and vicinity with the result that nests were taken the entire length of the electric line from Hampden to Old Town and in Brewer. All nests should be removed and burned at the earliest moment."

FRUIT TREE CATERPILLARS.

Ancylis (Phoxopteris) nubeculana, the apple leaf sewer.

From Enfield, Maine, August 28, and later also from other localities come reports of injury to the leaves of several varieties of apples. The leaf is folded along the mid rib, the two sides being brought together, the caterpillar constructing its nest within (fig. 18). The winter is passed in the larval condition in the folded leaves which lie on the ground. In April the larvae transform to chrysalids and about 10 days later the moths begin to appear, laying eggs in June. The caterpillar is about $\frac{1}{2}$ inch in length when full grown, yellowish green, with yellow head, and horny shield on the next segment a little darker, with a black dot on each side. On each of the remaining segments there are some pale, shiny, raised dots (tubercles) from every one of which arises usually a single hair. The tubercles of the first and second abdominal segment are arranged as follows: one on each side of the middle dorsal line, the second behind and below this, the third above the spiracle, the fourth and fifth below the spiracle and fused, the sixth below and behind these, below this is the seventh with 2 or 3 bristles, and the eighth near the central line on the ventral surface. The claws of the abdominal legs, over 40 in number, alternately long and short, are arranged in an unbroken circle. The anal plate bears 4 long bristles and is widely separated from the preanal plate which is small and bears 2 bristles. The anal fork (fig. 32) has 6 tines, the middle 4 slightly bifid at the apex. The mouth parts are shown in figures (28, 29, 31). The palpi of the second maxillae are quite slender, each with a long terminal bristle.

When the injury to the tree is serious the fallen leaves may be raked up and burned in the autumn to restrict the development of the moth the following season. (Lot 792.)

Coleophora fletcherella (Cigar case bearer).

The cases of this insect were gathered at Highmoor Farm near Monmouth, Maine, June 24. The small caterpillars which live in cigar-shaped cases feed from April to June on the buds and foliage of apple trees. The little gray moths appear from

the middle of June to middle of July or a little later, lay eggs, which hatch in about two weeks. The young, which are leaf miners, soon make cases, which they later attach to the bark, thus passing the winter, beginning to feed again early the following spring. If the trees are sprayed for the codling moth the case bearers are also destroyed. (Lot 762.)

Enarmonia prunivora (Lesser apple worm).

As we have no Station records of the occurrence of this insect in Maine, it may be of interest to note that a number of specimens of this species was reared August 5-9 from a lot of small apples obtained June 30 from an orchard at Oxford, Maine. The owner of the place reported very serious injury to his crop due to this insect as well as to the codling moth (*Carpocapsa pomonella*) and the plum curculio.

According to Fletcher and others this insect also attacks haws, crabapple, plums, and elm and oak galls. The larva feeds upon the apple in a manner similar to that of the codling moth, for which it is doubtless frequently mistaken. Besides by its smaller size the larva may be distinguished from that of the codling moth by the presence of the anal fork. The adult moth expands about $\frac{5}{8}$ of an inch across the wing. The ground color of the front wings is black, with patches of pale rusty red, of gray, and of yellowish white and steel blue oblique lines. The hind wings are dusky gray at the base, shading to black at the apex.

The insect may be combatted by methods used against the codling moth. (Lot 785.)

GARDEN CATERPILLARS.

The woolly bear caterpillars, *Estigmene acreae**, and *Diacrisia* (*Spilosoma*) *virginica** have caused much damage to garden crops, taking practically anything from peas to onions, and to flower gardens. Though very troublesome, neither of these hairy caterpillars were as numerous as during 1908.

* A descriptive economic circular is available to applicants.

HEMIPTERA.

(Bugs.)

San Jose Scale in Maine.

The following particulars concerning this pest are given by Mr. E. F. Hitchings in answer to our inquiry.

"A single infestation of this most dreaded of all orchard pests is situated in the town of Limerick. As near as can be ascertained it was introduced about 8 years ago on one or more apple trees procured from a New York nursery. The spread is confined to some 20 trees in a rather isolated orchard where there would be but little danger of its extending to other localities. As soon as the infestation was discovered, the affected trees were sprayed with the lime-sulphur mixture. The orchard was again visited at the time when it was thought the first young would appear. It was found that a large proportion of the scales was destroyed, but the young were crawling on a number of the trees. The trees were then sprayed with kerosene emulsion, which killed the exposed young. It is proposed that a thorough treatment will be given the orchard and followed up until the infestation is entirely destroyed."

Specimens of this long dreaded orchard pest were received at the Station from Limerick, Maine, in August, 1909, for determination. Most of the scales on the several twigs submitted were dead but there were some live and healthy specimens. The infestation at Limerick is the first occurrence known in Maine. Any one finding scales on his trees resembling those shown in figures 11 and 12 should send specimens to the Department of Agriculture at Augusta or to the Experiment Station at Orono for identification. (Lot 794.)

Eriopeltis festucae (Cottony Grass Scale).

The white egg sacs of this insect on leaves of meadow grass are an annual occurrence and were plentiful in the vicinity of Orono this past season. Little complaint has been made for several years by owners of grass lands invaded by the cottony scale. (Lot 770.)

Typhlocyba comes (Grape leaf hopper).

This bug is reported from Calais, Maine, as being very destructive to the Virginia creeper, infesting almost all the vines of that section. The correspondent states that it has been prevalent there for a number of years and while the plant is not absolutely destroyed the growth is much checked, and the leaves become spotted, wither and fall.

The eggs are stuck to the lower surface of the leaves in June; from June to September the immature form, the nymph, a light yellowish green bug with yellow side stripes, works upon the leaves. The adults, about $\frac{1}{8}$ inch in length, marked with yellow and red, beginning to appear in August, continue the work of destruction begun by the nymphs. Spraying in July with whale oil soap solution and the use of sticky screens have been recommended for the pest in vineyards. (Lot 790.)

Psylla floccosa Patch (Downy Psyllid of Alder).

Very common upon the Alder (*Alnus incana*) from early spring to late June, are fluffy, woolly masses, abundant on the under side of leaves. Fig. 17 represents such a characteristic mass. If the white fluff is removed, little yellow and green crab shaped objects are found beneath the protective mass which is secreted by wax glands similar in function to those of certain woolly plant lice and scale insects. About the last of June these insects acquire wings and shaking themselves free from the white secretion, take to flight. This species was described and figured in Canadian Entomologist, September, 1909. (Lots 727, 735, 740, 744.)

APHIDIDAE.

Plant lice found a favorable season and many species were noticed in the vicinity of Orono. Attention, however, was concentrated for the most part on those species of the Genus *Chermes* causing abnormal growths on spruce. Six species were studied, namely, *Chermes pinifoliae* Fitch, *Chermes abietis* Linn, *Chermes similis* Gillette, *Chermes floccus* Patch, *Chermes consolidatus* Patch, and *Chermes lariciatus* Patch. The three new species were very briefly described in Psyche for Decem-

ber, 1909. *Pinifoliae* and *abietis* were treated in an economic bulletin No. 171 of this Station and the six species are described and figured and the main points in their life histories given in Chermes of Maine Conifers, Bulletin 173 of this Station.

A woolly species, *Pemphigus venafuscus* Patch, on the stems of ash occurred in abundance in the vicinity of Orono. This species was described and figured in Entomological News, July, 1909.

The Canadian tick-trefoil is yearly visited by a plant louse causing leaf curl and twist. This was described as *Microparsus variabilis* new genus and new species in Entomological News, October, 1909.

Gall making aphids of the elm were abundant but as the group will be treated more fully in a separate publication it is not necessary to discuss them here.

Anaphothrips striata (Grass thrips).

Late in June Timothy grass showed the characteristic dry and bleached stems due to injury by the grass thrips. In some meadows considerable areas were rendered conspicuous in this way. (Lot 750.)

ORTHOPTERA.

(Grasshoppers, roaches and crickets.)

Grasshoppers caused enough damage during 1909 as during 1907 and 1908 to be classed as a plague. Orchards and garden crops suffered from the attacks of these ravenous insects. The species concerned, as far as ascertained, were the same as those mentioned in the Insect Notes for 1908.

DIPTERA (Flies).

MYCETOPHILIDAE (Fungus gnats).

A work on the fungus gnats of North America is now in the course of preparation, the first part of which appearing in Bulletin 172 of this Station. As it is the purpose to discuss in that paper in detail the habits of several species, it will only be

necessary here to state that certain forms are exceedingly common and some are known to be injurious to corn, potatoes, apples, mushrooms, and other forms of plant life.

Of the lower forms the larva of *Mycetobia* lives on decaying wood and has also been accused of attacking the sound roots of apple and peach trees, though it is very doubtful if they are able to cause serious injury here. Walsh, Riley, and Glover all agree as to the inoffensive character of the members of this genus. The *Sciophilinae* and *Mycetophilinae* are known to live upon decaying wood and also upon mushrooms. In the tenth report of the State Entomologist of New York, Lintner quotes a prominent mushroom grower as saying that the crowning evil of mushroom culture is the maggot of the fungus gnat. "By cutting open the mushroom you may see numerous worm holes in some of these, both in the caps and the stems, and no doubt can discover some of the maggots. They are tiny fellows with white body and black head, measuring about 1-5 of an inch in length. . . ." It may be stated in this connection that frequently associated with the maggots of the fungus gnats are larvae of *Phoridae*, also serious pests.

The *Sciarinae*, a subfamily of the fungus gnats and known to the Germans as Trauermücken (Mourning gnats), which also have been accused of damaging fungi by Doctors Smith, Felt, and others, are probably less frequently found in sound plants than in such as are already badly decayed, differing in this respect from those mentioned before. Professor Forbes, State Entomologist of Illinois, reports that they are occasionally injurious to seed corn. They are also known to feed upon potatoes affected by scab or rot, and in some instances appear to be the precursor of some form of scab. This form of scab should not be confused with the common potato scab (*Oospora scabies*). They are found in apples associated with the railroad worm (apple maggot) and in bulbs of tulips and peonies. Whether they are actually injurious to the roots of potted plants is not yet definitely known, though they are looked upon with suspicion by florists generally.

Mycetobia divergens Walker.

The larva of this species, living in decayed wood from an apple tree, was sent to us by a correspondent from Gardiner,

Maine. As the larva is not figured in Bulletin No. 172 some details will be figured and described here. The larva is white in color, 12 segmented, slender and legless. The head is yellowish brown, oblong, about twice as long as wide, the labrum has a rounded margin, setose ventrally. The mandibles are brown, margined with a number of teeth and with a toothed claw on the inner side (figs. 41, 42); the lateral comb of the epipharynx has 6 teeth (fig. 39); the labium has several smaller as well as two larger ones and its lateral margins are fringed with long hairs (fig. 38). The maxilla is shown in figure 40. There are a few scattered bristles on the head and two eye spots. The two main tracheal trunks end in the thoracic spiracles (fig. 43) on the center of the lateral margin of the first thoracic segment and extend to the apex of the twelfth abdominal segment; they are connected by a strong commissure at the anterior end of the second thoracic segment. The length of the full grown larva is about $\frac{1}{4}$ of an inch.

The pupa is brown; tapering, with a few spines on thorax and abdomen projecting backward; length 1-6 of an inch.

TIPULIDAE (Crane flies).

Two crane flies from Maine may be noticed at this time as being of particular interest. The one, *Ctenophora apicata*, because of its rarity, and the other because of possible economic interest to potato and apple growers.

Ctenophora apicata.

Nine males and six females of this handsome crane fly were reared from larvae and pupae found in the decaying wood of an elm tree. They were collected at Orono, Maine, June 23, by Mr. William Woods. Though this species is not of economic importance still it may not be out of place to give here a brief description owing to its rarity. The male appears never to have been described.

The full grown larva is white, cylindrical, over $1\frac{1}{8}$ inches long. The head is black, well formed, oval, $\frac{3}{4}$ of an inch in diameter and twice as long; apparently only the apical fourth can be exerted. The antennae are cylindrical with an apical papilla. On the dorsal surface of the head at some distance

back of each antenna is a slender, flexible spine. Here and there upon the body may be seen a minute bristle; at the caudal end are the two black spiracles, dorsad of which are 4 finger-like processes and ventrad are 2 conical protuberances.

The pupa is brown in color; $\frac{3}{4}$ to $\frac{7}{8}$ of an inch in length. On the anterior part of the thorax on the dorsal surface are the breathing organs, slender, transversely striated, about 3-32 of an inch in length. Each intermediate abdominal segment has 8 pairs of sharply pointed conical protuberances, those on the posterior part of the venter on the middle line larger than those on the mid-dorsal line and much larger than those on the sides. The last segment has but 4 and the next to the last 8 such projections. On the anterior segments some may be much reduced or even wanting.

The adults show considerable variation in coloring, there being a light and dark form of each sex. Between these forms are several specimens showing more or less intergradation.

Male. Dark form. Shining black; the tips of the basal antennal joints, the tips of the antennal branches, of which there are four rows, knob of halteres and the palpi more or less fuscous; the fore legs, the tibiae and tarsi of the middle legs together with the middle section of the femora, the hind tibiae and tarsi, and the dorsal portion of the collar are yellow; wings deep blackish brown, except for the hyaline spots on the veins bounding proximally and distally the discal cell and one at the stigma (fig. 14).

Pale form. Shining reddish yellow excepting an occipital triangle, the humeri, base of metanotum, thoracic and pleural sutures, narrow lateral and hind margins of the more posterior segments, dorsal spot on the first segment, and forceps themselves, tibial spurs and apical fourth of middle and hind femora are black. Wings yellowish, subfuscous apically.

Female. Dark form. Like the male but the basal antennal joints, the collar and the whole of the middle femora are black; the lateral posterior margin of the fifth segment of the abdomen and the tip of the ovipositor are yellow.

Pale form as described by Osten Sacken. (Lot 743.)

Trichocera regelationis.

In Insect Notes for 1907 (Bulletin No. 148, Me. Agric. Expt. Station, p. 278) mention was made of the occurrence of this species breeding in potatoes; the slender maggots having been found in a lot of potatoes that froze the preceding fall and were soft and rotting the following May. Whether this species would develop in sound potatoes was not ascertained. In a letter dated May 6, 1907, from a correspondent in Patten, we read: ". . . This maggot goes only under the skin; not doing much damage to the tuber. . . . Sometimes they will eat turnips, especially sweet ones, so that it spoils them. Carrots, parsnips, onions, and in fact everything that has a tender root." From the context of the remaining portion of the letter it is evident that our correspondent has confused the maggots of several species of flies, among them *Sciara*, *Pegomyia*, and perhaps others. For this reason a brief description of the maggot will be given here with the hope that the reader may keep a lookout for similar larvae and submit them to the Experiment Station for identification. This species has also been recorded as being injurious to apples.

The maggot is a slender, legless, whitish creature, over $\frac{3}{8}$ of an inch in length when full grown. Its head is brown, narrower than the first body segment, but quite distinct wholly exerted, and apparently not retractile, differing in this respect from the majority of crane fly larvae. The body segments, 12 in number, are very indistinctly marked, the transverse folds on each segment being nearly as distinct as the sutures themselves. The surface of the body is rather thickly covered with fine pale hairs more or less erect and mingled with these are some small bristles not markedly differentiated from the hairs. The mouth parts resemble somewhat those of *Rhyphus*. The labrum, epipharynx, mandible, hypopharynx, maxilla and labium, are as shown in the figures (figs. 52-55). The lateral comb of the epipharynx (ep. c. fig. 53) has blunt, rounded teeth. On the ventral side of the last segment is the anal plate (fig. 51) perforated by a transverse slit at the center. The anterior spiracles or breathing organs are small, rounded openings situated on the dorsal surface of the first thoracic segment; the

posterior spiracles (fig. 57) on the last segment open dorsally and are each covered by a hairy flap (fig. 56 fl.). The body ends in two fleshy lobes (fig. 56).

The pupa is over $\frac{1}{4}$ inch long with small, papilliform, thoracic spiracles; the caudal end narrower, its apex with 2 slender pointed lobes. The slender, long-legged, mosquito-like adult may readily be distinguished from other crane flies by the presence of a very short and much curved vein near the base of the wing posteriorly and by other points in venation shown in figure 13. These flies are not uncommonly found even in late fall and winter hovering over a small brook or spring or over the snow. (Lot 188.)

RHYPHIDAE (False Crane flies).

Rhyphus punctatus.

This fly though probably of no great economic importance may not be without interest because of the resemblance the larvae bear to those of *Trichocera* described above and because of the resemblance the adults bear to the malarial mosquitoes for which they are occasionally mistaken by the non-entomologist. The larvae of the members of this family live in decaying vegetable matter. The specimens from which the following description was drawn were found in cow dung.

The larva is a slender, cylindrical, legless maggot over $\frac{3}{8}$ of an inch in length with 12 distinct body segments which are broadly marked with mottled brownish or purplish bands leaving only the sutures white. The twelfth segment is shorter and smaller than the others, less sharply separated from the eleventh, and ends in 2 rounded fleshy lobes margined with setae (fig. 48). Ventrally there is an oval anal plate perforated by a transverse slit near the posterior margin (fig. 49). Dorsally are the 2 crescent shaped spiracles (fig. 48 sp.) which are bounded laterally though not covered by flaps; between them is a transverse fold margined with setae. The thoracic spiracles (fig. 47) are small and have but 3 more or less oval apertures. The antennae are very minute, two segmented and papilla-like. The mandible (fig. 44) is apically densely covered with two tufts of hair, one on each side, and which so overhang the tip that

its structure cannot be described. On the inner side of the mandible is a spur with several teeth. The lateral comb of the epipharynx (fig. 46) is provided with several blunt teeth. The labrum is oval and margined with setae, the labium (fig. 45 lm) is deeply bifid.

The adult which is frequently seen upon the windows of dwellings resembles somewhat some malarial mosquitoes in possessing spotted wings—but it may readily be distinguished from the mosquito by its short, blunt proboscis.

CULICIDÆ (Mosquitoes).

These pests are with us the greater part of the year, though troublesome mainly in spring and summer. In recent years they have been much studied because of their relation to malaria and other diseases. In Insect Notes for 1906 (Bul. No. 134, Me. Agr. Expt. Station) is given a short list of Maine mosquitoes, among them two species of *Anopheles*, one of which is known to be a malaria carrier. *Anopheles* may readily be distinguished from the others by the spotted wings, by the form of the mouth parts which consist of 3 slender processes, and by the habit of standing when at rest upon a wall with the body inclined at an angle with the vertical. Though no special effort was made to collect them, two rather rare non-malarial mosquitoes were taken the past season, *Culex atropalpus* and *saxatilis*. The former was bred from larvae taken in the rock pools from the Stillwater branch of the Penobscot river, September 22. Of the latter, specimens were captured in the basement of a dwelling in Orono on December 17 and 21.

As all mosquitoes breed in water, the covering of rain water barrels, filling in of small pools and draining of swamps will do much toward reducing the number of these insects.

MUSCIDÆ (Flies).

Epochra canadensis (Currant fruit fly).

In a letter dated July 16 a correspondent from Westbrook reports that one-third of his currant crop was ruined by a maggot which lives in the fruit. It is the larva of the currant fly,

a small white maggot about 1-3 of an inch in length. The adult is a small two-winged fly with banded wings. It is described in Bulletin No. 35 Me. Agric. Expt. Station. (Lot 766.)

Drosophila busckii.

This insect belongs to the same genus as the little yellow flies commonly known as Pomace or fruit flies. It has been bred several times from larva found in potato affected by rot. Apparently only the potatoes with broken skin were attacked, though there were a number of decayed tubers. From this it seems evident that the flies were not responsible in starting the rot. As may be expected this fly in all its stages greatly resembles *Drosophila ampelophila*, the common Pomace fly, described by Professor Comstock in the Report of the Entomologist, Department of Agriculture for '81-'82.

The egg though similar in shape differs from that of *D. ampelophila* in having 4 slender and pointed filaments (not blunt) near the micropyle. The larva is elongate oval, about 5-16 of an inch in length when full grown; the head end more slender and pointed; the posterior end of the body broadest. The antennae are minute tubercles placed on the dorsal surface of the first segment; the 2 jaw hooks are black in color and each provided with 4 slender teeth of which the third from the base is smallest (fig. 50). Fringing the mouth are a number of minute colorless, recurved hooks only distinctly visible in profile. The cephalic spiracles each consist of about 12 tracheal tubes of varying lengths, slightly hooked at the end. These tubes may be extended or retracted within a cylinder which is somewhat longer than wide. The body is covered, though not densely, with erect setulae, and each segment is provided with about 8 spinose protuberances, fewer and longer on the last 2 segments where they nearly equal the caudal spiracle in length. The latter consists of 2 coalesced tubes. The pupa, which is about $\frac{1}{8}$ of an inch long, resembles the larvae in having the body sparsely covered with setulae, spinose protuberances, and a caudal spiracle of 2 coalesced tubes. At the head end there is a large concavity, covered by a plate which comes off when the adult emerges. To this plate are attached the thoracic spiracles, cylindrical processes each terminating in 12 tracheal

tubes of varying length. The adult is a little yellow fly about $\frac{1}{8}$ of an inch long with striped thorax and abdomen with black markings. (Lot 847.)

Pegomyia sp.? (Cabbage maggots).

A correspondent from Bowdoinham, Maine, in a letter dated July 1, reports the destruction of 25,000 cauliflower plants by maggots. As no specimens were received the species was not determined, though it may have been *Pegomyia brassicae* or some allied form.

Musca domestica (House or typhoid fly).

The ever present and pestiferous house fly because of its filthy habits continues to be a serious menace to the health of the community. As they breed in stable manure every effort should be made to reduce their number by the removal of this refuse from the vicinity of dwellings. Foods of all kinds should be carefully protected from them. Milk should be handled with great care to prevent flies from contaminating it, as it is a most excellent medium for the development of the typhoid bacilli as well as of the bacilli of some other intestinal troubles to which young children are highly susceptible. Upon this subject much has been said and written, but too much stress cannot be laid upon a matter of such vital importance.

Frontina archippivora (A parasitic fly).

A specimen of the chrysalis of the monarch butterfly (*Anosia plexippus*) sent from South Berwick was found to be parasitized by the above named fly. The pupal stage of the parasite was passed outside of the butterfly chrysalis. The flies emerged August 28. (Lot 789.)

COLEOPTERA.

(Beetles.)

Carpophilus hemipterus.

Many of these beetles and their larvae and pupae were found in a box of California dried peaches sent to the Station for examination from a storage house in Portland. The beetle (fig. 15) which is about $\frac{1}{8}$ of an inch in length may readily be recognized by its short wing covers which are not produced over the last 2 abdominal segments. The insect is mainly dark brown in color; the legs, the posterior half and a spot near the lateral anterior margin of each wing cover, are yellow. The legs are rather stout, the tibiae are somewhat broadened, and the antennae are clubbed. Both larvae and adults feed in decaying and fermenting sap, pomace and fruit, particularly improperly cured dried figs, peaches, apples and the like, and are often associated with mites and the larvae of Pomace Flies (*Drosophila*). The insect is very widely distributed, almost cosmopolitan, and once established in a fruit packing house may prove a serious pest.

The larva or grub is a slender flattened creature about 1-5 of an inch in length, white in color with a brownish head and 3 pairs of legs. The mouth parts are as shown in figs. 20-22. There is a pair of thoracic spiracles on the second segment, and 8 pairs of abdominal spiracles, none on the last segment. Upon the body are a few scattered setae; on the dorsal surface of the last segment (fig. 23) is a pair of stout pointed tubercles, a stouter pair at the apex and a smaller one at the base of each of the latter. The pupa is of the simple, unprotected type, each abdominal segment has about 4 strong setose spines, largest posteriorly.

The destruction of all infested fruit by burning, and thorough fumigation of the warehouse by hydrocyanic gas are the only remedies which can be suggested for the destruction of this pest. (Lot 843.)

Euphoria inda (Bumble flower beetles).

Large beetles (fig. 16) about $\frac{5}{8}$ of an inch in length, have been reported to the Station several times this season eating

apples in storage. As a single individual does not always confine its attention to one apple, a few beetles may sometimes injure a large number by biting into them. Harris records a similar habit regarding peaches. The head and thorax of this beetle are dark reddish brown, or almost black, thickly covered with short yellowish hairs, the wing cases are light yellowish brown mottled with irregular black dots. The under side of the insect is very hairy. As this insect is quite conspicuous it may be controled by hand picking. (Lot 826.)

Conotrachelus nenuphar (Plum curculio).*

At Lisbon, Maine, this insect has nearly ruined a crop of plums, while the apples from orchards in many parts of the State are reported as being commonly and generally infested with this pest. (Lots 747, 757.)

Elateridae (Wire worms).*

A farmer from Lagrange says: ". . . these threaten to ruin my potatoes. Every one raising potatoes in this vicinity has the same complaint. We did not see anything of them on this farm last year but one of my neighbors had them in his potatoes. . . ." Deep plowing and harrowing in the fall to expose the pupa and beetle, as a preventive measure, are most highly recommended. (Lot 763.)

Scolytid Beetles in Pine Cones.

Some specimens of cones from the White Pine, brought to us by Doctor Chrysler of the University of Maine, collected June 15 in Orono, were found to be mined by a Scolytid beetle. Every cone on the branch brought in was affected. On opening a cone, the whole structure was found to be mined through, two or three beetles being inside; and a gummy brown mass at or near the base giving evidence of the work within. The beetles made an exit at or near the apex. The cones were those which started to grow last year. Professor J. M. Swaine, of Macdonald College, Canada, who has made a special study of this family of beetles, to whom specimens were sent, determined them as *Pityophthorus coniperda*. (Lot 734.)

* A descriptive economic circular is available to applicants.

Xyleborus dispar (Shot borer).

In a letter dated June 3, from a correspondent in West Tremont, Maine, the complaint is made that this beetle is killing the young apple trees. This beetle is a native species and attacks both hard and soft wood trees as well as the apple trees. The young larvae bore into the wood, making deep channels which in the small twigs interfere with the circulation of the sap, and the twigs wither, giving the appearance of blight. The beetle is less than one-eighth of an inch in length, dark brown or nearly black in color, with legs and antennae rusty red. They leave their burrows in July and deposit eggs before August, according to Harvey. It is a difficult insect to exterminate, especially in orchards in the vicinity of forest trees. Cutting out of diseased limbs and burning is the most satisfactory treatment. Lot 730.

Monohammus scutellatus (Pine borer).

Beetles of this species were found quite abundantly, June 30, in Orono, upon the larch. On many of the trees the young twigs appeared as if the bark had been chewed off. In Insect Notes for 1908 (Me. Agr. Exp. Station Bulletin No. 162) there is a record of this species destroying pine needles. The beetle is about $\frac{3}{4}$ of an inch in length with antennae double the length of the body in the male.* It is shining black, its wing-covers having small patches of short hairs here and there resembling spots of white mold, their surface rough from coarse confluent punctures and the thorax similarly punctured across its middle, its base and apex with irregular transverse wrinkles, and its sides with a conical spine, which is not clothed with hairs, and the scutellum coated over with white hairs. The large white grub bores in the wood. The beetle is rather common in Maine. If anyone should see this insect feeding upon leaves or twigs of any tree, he will confer a favor upon us if he send in a record of his observations. Lot 780.

HYMENOPTERA.

(Four-winged flies, etc.)

Lophyrus abietis (Spruce saw fly).

This saw fly, noted last year in Bulletin 162, was again very abundant the past season on fir and spruce. From Birch Island, near the mouth of Damariscotta River, a correspondent writes August 3: “. . . I find the saw fly busily at work, and the devastation in the country around is appalling. Here it is now at work on the red spruce and I have a number of trees entirely eaten off, and the caterpillars lie as thick as leaves. . . .” In woodland trees artificial remedial measures are probably impractical and there the pest can only be left to such natural control as climatic conditions, fungous disease, or the attacks of predaceous or parasitic insects. For ornamental trees we may resort to spraying as soon as the larvae are in evidence.

From a large number of cocoons collected, about an equal number of males and females emerged. A few parasites, *Pimpla* sp. and others, were also reared from the cocoons. (Lot 791.)

Nematus erichsonii (Larch saw fly).

A report from Gardiner, Maine, dated July 14, states that “a small grove of larch near the house stripped almost as bare as winter.” This is the insect which caused such devastation to the larches in this State a number of years ago, that in some sections they were wholly exterminated.

As with the Spruce saw fly we must place our chief reliance upon the natural enemies, parasites and predaceous bugs and climatic conditions, to hold this pest in check upon woodland trees. Spraying where feasible will control them. (Lot 765.)

EXPLANATION OF PLATES.

PLATE

- 10-12 San Jose or Pernicious scale (*Aspidiotus perniciosus*).
Page 28.
- 10 Active young, greatly enlarged (After Felt).
11 Young scale in black stage, greatly enlarged (After Felt).
12 Group of adult scales, enlarged (After Felt).
13 Wing of Crane fly (*Trichocera regalationis*). Page 34.
14 Wing of Crane fly (*Ctenophora apicata*). Page 32.
15 Sap beetle (*Carpophilus hemipterus*), greatly enlarged.
Page 39.
16 Bumble flower beetle (*Euphoria inda*). Twice natural
size. Page 39.

PLATE

- 17 Leaf of the Alder showing secretion of Downy Psyllid.
Page 29.
18 Apple leaf folded by apple leaf sewer. Page 26.
19 Birch leaf showing work of *Bucculatrix canadensisella*.
Page 24.

PLATE

All details are of the larvae unless otherwise noted. an = antenna; ep = epipharynx; ep. c = comb of epipharynx; fl = flap covering spiracle; hyp = hypopharynx; lm = labium; lr = labrum; mn = mandible; mx = maxilla; sp = spiracle.

Carpophilus hemipterus. Page 39.

- 20 Mouth parts; Dorsal aspect. x 63.
21 Labium and maxilla; Ventral aspect. x 63.
22 Labium; Ventral aspect. x 175.
23 Caudal end; Dorsal aspect. x 40.

Achatodes zeae. Page 23.

- 24 Mouth parts; Dorsal aspect. x 20.
25 Maxilla. x 20.
26 Anal plate; Dorsal aspect. x 10.
27 Apex of abdomen of pupa. x 40.

Ancylis (Phoxopterus) nubeculana. Page 26.

- 28 Mandible. x 80.
- 29 Labrum; Dorsal aspect. x 80.
- 30 Antenna. x 80.
- 31 Labium and first maxilla. x 80.
- 32 Anal fork. x 175.

Bucculatrix canadensisella. Page 24.

- 33 Labium and first maxilla. x 175.
- 34 Mandible. x 175.
- 35 Labrum; Dorsal aspect. x 175.
- 36 Abdominal leg. x 175.
- 37 Claw of anal leg. x 350.

Mycetobia divergens. Page 31.

- 38 Labrum; Ventral aspect. x 350.
- 39 Lateral comb of epipharynx. x 350.
- 40 Maxilla; Ventral aspect. x 175.
- 41 Mandible; Lateral aspect. x 175.
- 42 Mandible; Mesal aspect. x 175.
- 43 Thoracic spiracle. x 350.

Rhyphus punctatus. Page 35.

- 44 Mandible; Lateral aspect. x 350.
- 45 Labium, maxilla and hypopharynx; Ventral aspect. x 63.
- 46 Lateral comb of epipharynx. x 350.
- 47 Thoracic spiracle. x 350.
- 48 Caudal end, dorsal. x 80.
- 49 Anal plate. x 25.

Drosophila busckii. Page 37.

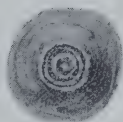
- 50 Mandibular hook. x 175.

Trichocera regelationis. Page 34.

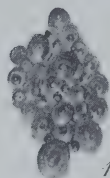
- 51 Anal plate. x 175.
- 52 Mandible; Mesal aspect. x 175.
- 53 Labrum; Ventral aspect. x 175.
- 54 Mandible; Lateral aspect. x 175.
- 55 Lower mouth parts; Ventral aspect. x 75.
- 56 Caudal end; Dorsal aspect. x 40.
- 57 Caudal spiracle. x 80.



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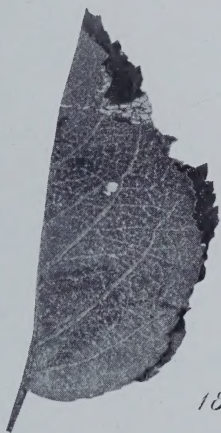
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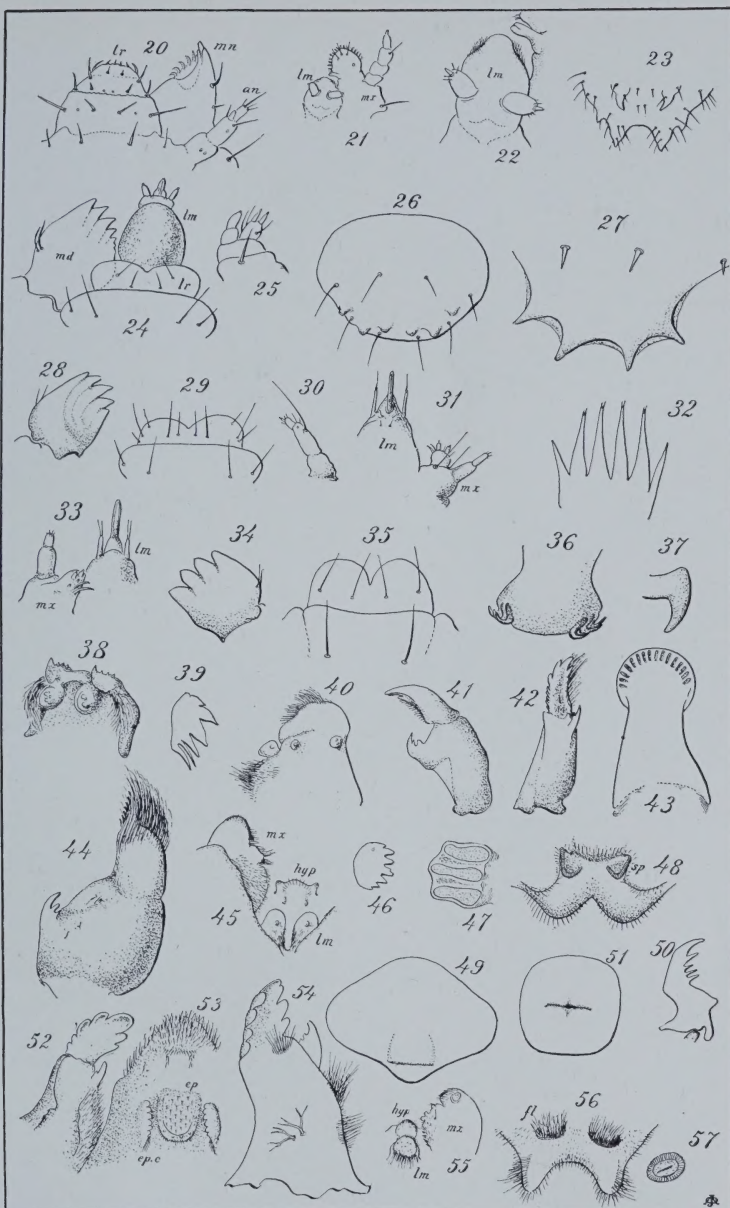


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